

PI: Vinay Kashyap/Smithsonian Astrophysical Observatory

Proposal Title: Next Generation Tools for Diagnostics of Solar Coronal Structure

Abstract: The aim of this proposal is to develop and make publicly available a set of robust IDL-based tools for investigation of the complete emission structure of the Sun from a wide variety of solar data sets but with emphasis on the new instrumentation on Solar-B and SDO. In particular, a major focus of our efforts will be towards robust investigation of temperature structure, including an extremely fast and efficient method for estimating Differential Emission Measures (DEMs). The proposed set of tools will allow scientists to investigate imaging and spectral data, understand the origins of observed flux in different bandpasses, interactively isolate coronal structures for analysis, derive DEMs for multi-bandpass image sets of up to 16 million pixels as a function of space and time and with the crucially important capability to estimate errors in the reconstructions, and to apply the same analyses seamlessly to observations with different instrumentation and different satellites. Visualization tools will be provided to show the evolution of DEMs in time and for construction of single temperature images from the DEMs. The tool set will build on and derive from the existing PINTofALE software developed for the analysis of high-resolution X-ray and EUV stellar spectra, such as those observed with the Chandra Mission. This will allow the users flexibility in their choice of atomic data and emission line codes, allow for easy modification of the assumptions that go into those codes, and incorporate the ability to take into account atomic data uncertainties. The combination will result in a very general software package for analysis of the solar outer atmosphere. The package will be fully-incorporated into SolarSoftWare.